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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/604,135	06/27/2003	Reinhard Lihl	LVIP106US	1134

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EXAMINER	
BLAKE, CAROLYN T	
ART UNIT	**PAPER NUMBER**
3724	

DATE MAILED: 02/23/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/604,135	LIHL ET AL.	
	Examiner	Art Unit	
	Carolyn T. Blake	3724	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 December 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) *5-9* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-4,10 and 11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *05 December 2005* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☒ Other: *Translation of DE 10228985.9*.

DETAILED ACTION

1. This action is in response to applicant's amendment filed on December 5, 2005.

2. The text of those sections in Title 35, U.S. Code not included in this action can be found in a prior Office action.

Drawings and Specification

3. The amendment filed December 5, 2005 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

- FIG 8; and
- Paragraph 22A.

Applicant is required to cancel the new matter in the reply to this Office Action.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claims 1-4, 10, and 11 rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the

time the application was filed, had possession of the claimed invention. From the original disclosure, it does not appear Applicant had possession of the claimed invention with respect to having three illumination systems at the same time in the same microtome, as well as how to make each function over the other.

6. Claims 1-4, 10, and 11 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. From the original disclosure, one of ordinary skill in the art is not enabled by the disclosure how to make a microtome with three illumination systems or how to use a microtome with respect to the functioning of one light source over another.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 1-4, 10, and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. From the original disclosure, it is not clear how each of the illumination systems can be provided at the same time.

Claim Rejections - 35 USC § 103

9. Claims 1, 10, and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over German Patent DE 32 24 375 to Bilek in view of German

Patent DE 36 15 713 to Wolf and US Patent Application 2003/0024368 A1 to Fukuoka.

To the degree understood, Bilek discloses a microtome (FIGS 1-3) having a knife (3), a specimen arm (1) movable relative to the knife (3), and at least one light source (6) acting as a base-mounted illumination system. Bilek fails to disclose the light source is a light-emitting diode. Wolf discloses a microtome (FIGS 1 and 2) having a specimen arm (18) and an illumination system with a light source in which the light source is a light-emitting diode (89). Furthermore, Fukuoka discloses an illumination system for a cutting device in which incandescent lamps, fluorescent lamps, or light-emitting diodes can be interchanged. Fukuoka states it is preferable to use LEDs because they generate relatively no heat in comparison to the incandescent lamps or fluorescent lamps (paragraph 55). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a light-emitting diode, as disclosed by Wolf, on the Bilek device in order to reduce heat generation, as disclosed by Fukuoka.

10. Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bilek in view of Wolf and Fukuoka as applied to claim 1 above, and further in view of Shankle et al (6,195,016 B1).

Regarding claim 2, the Bilek-Wolf-Fukuoka combination discloses the base-mounted illumination system encompasses at least one light-emitting diode, but fails to disclose a frosted glass disk mounted in front of the light-emitting diode. Shankle et al disclose the use of a frosted glass disk in combination with

LEDs for the purpose of providing uniform white illumination light (col. 7, lines 1-7). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a frosted glass disk, as disclosed by Shankle et al, on the Bilek in view of Wolf and Fukuoka device for the purpose of providing uniform white illumination light.

Regarding claim 3, Bilek discloses the light source (6) is mounted on the microtome in such a way that a light beam (8) proceeding from the base-mounted illumination system is reflected by a backside (15) of the knife (3) and at the preparation so as thereby to achieve uniform illumination of the gap between the knife (3) and preparation. See FIG 3.

11. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Bilek in view of Wolf, Fukuoka, and Shankle et al as applied to claims 2 and 3 above, and further in view of Douglas-Hamilton et al (4,896,967).

Bilek discloses the light source (6) coincides with an optical axis (5) of an observation microscope (4). However, the Bilek-Wolf-Fukuoka combination fails to disclose the base-mounted illumination system has a first and second light-emitting diode that are inclined with respect to one another at an angle. Douglas-Hamilton et al disclose a base-mounted illumination system (FIG 8) with a first and second light-emitting diode (134) that are inclined with respect to one another at an angle (142). This configuration enhances the uniformity of illumination while preventing direct radiation from entering the observation microscope (col. 7, lines 19-26). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a first and

second light-emitting diode that are inclined with respect to one another at an angle, as disclosed by Douglas-Hamilton et al, on the Bilek in view of Wolf, Fukuoka, and Shankle et al device for the purpose of providing uniform illumination,while reducing direct radiation.

Response to Arguments

12. Applicant's arguments filed December 5, 2005 have been fully considered but they are not persuasive.

As previously indicated, the examiner's art rejection of the claims is based on the interpretation that the three illumination systems are being claimed in the alternative.

Included in this Office action is a translation of DE 10228985.9. The instant application claims priority to this application. According to this translation, the foreign priority document states "at least one source of light." While it may be implied that two or more light sources may be used, there is no evidence that when more than one source of light is used it is a totally different kind. It should also be noted that the different type of light sources are only claimed in the alternative.

It is still unclear to the examiner how or why the three illumination systems would be used at the same time. It appears there could be interference between the three systems that would result in a distortion of the specimen. The disclosure never discusses the advantage of having three systems instead of one, or visa versa.

It should be noted that Applicant did not traverse the election of species filed on October 25, 2004 based on the merits. Certainly, if Applicant intended to claim all three illumination systems together as one invention and not in the alternative, the requirement would not have been proper. Applicant did not argue this. In fact, each system is clearly defined as a separate embodiment in the original disclosure.

Conclusion

13. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Carolyn T. Blake whose telephone number is (571) 272-4503. The examiner can normally be reached on Monday to Friday, 8:00 AM to 5:30 PM, alternating Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Allan N. Shoap can be reached on (571) 272-4514. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

CB
February 13, 2006

Allan N. Shoap
Supervisory Patent Examiner
Group 3700

PTO 06-2493

German Patent No. 102 28 985 A1
(Offenlegungsschrift)

ILLUMINATING DEVICE FOR MICROTOMES OR ULTRAMICROTOMES

Dr. Reinhard Lihl et al.

UNITED STATES PATENT AND TRADEMARK OFFICE
WASHINGTON, D.C. FEBRUARY 2006
TRANSLATED BY THE MCELROY TRANSLATION COMPANY

FEDERAL REPUBLIC OF GERMANY
GERMAN PATENT OFFICE
PATENT NO. 102 28 985 A1
(Offenlegungsschrift)

Int. Cl.[7]:	G 01 N 1/06 G 02 B 21/06
Filing No.:	102 28 985.9
Filing Date:	June 28, 2002
Date Laid-open to Public Inspection:	January 15, 2004

ILLUMINATING DEVICE FOR MICROTOMES OR ULTRAMICROTOMES

[Beleuchtungseinrichtung für Mikrotome bzw. Ultramikrotome]

Inventors:	Dr. Reinhard Lihl et al.
Applicant:	Leica Mikrosysteme GmbH

Examination request according to §44 Patent Act has been filed

The following information has been taken [unedited] from documents submitted by the applicant

[0001]

The invention relates to a illuminating device for microtomes or ultramicrotomes. In particular, the invention relates to a microtome or ultramicrotome with a knife, an object arm that can move relative to the knife, and at least one light source for illuminating an area around the preparation.

State of the art

[0002]

There currently are illuminating devices for microtomes. There are three different illumination types that are used for microtomes and/or ultramicrotomes. One illumination type is the sub-floor illumination. This is used during the procedure for bringing the knife close to the

preparation to guarantee precise control of the distance between both components. The light source should be brought underneath the knife as close as possible, in order to represent the distance between the knife and preparation as a bright light gap for observation from above (e.g., with stereo microscope). (See: Reichert, Supernova, page 4 "Flex Optics," Reichert, Ultracut S, pages 4, 5, and 9 "Observation and Illumination System").

[0003]

Halogen lamps are used as the illuminating sources. However, due to their mechanical dimensions and also the heat output, they cannot be brought close to the knife. Therefore, the light is transported via optical fibers close to the knife.

[0004]

In another illumination type, for internal illumination of the preparation, small light bulbs or optical fibers are used for transillumination of the preparation (see Catalog, Ultracut S, page 8). Object details become visible. Heat output should be minimal.

[0005]

German Patent No. DE 32 24 375 discloses a device for testing the quality of the knife on a microtome. For this purpose, an observation microscope and also a sub-floor light source are provided for illuminating the object/knife area. In order to prevent displacing the illumination microscope and/or the sub-floor light source for the purpose of testing the cutting quality of the knife, the knife holder can pivot about the knife blade so far that the free surface of the knife blade encloses an angle of at least 20° with the beam path of the sub-floor light source.

[0006]

German Patent No. DE 32 35 951 discloses a microtome, especially an ultramicrotome, with an object carrier that can move relative to a knife. To enable optimal illumination of the object and thus improved representation of fine surface structures and the internal structures of the object and in order to be able to eliminate recalibrating the illumination system after position changes of the object relative to the knife, the light source or one of the light sources is arranged within the mounting opening of the object carrier, so that the object block made from transparent material and thus also the object are transilluminated from behind.

[0007]

German Patent No. DE 36 15 715 likewise discloses a microtome. The preparation to be cut is embedded in an object block made from transparent plastic. The object block is illuminated from the rear with the help of an optical waveguide.

[0008]

The main deficiency of the state of the art mentioned above is the heat output of the illuminating sources, which cause the preparation and/or the mechanical components of the microtome to expand. Above all, after a pause in the cutting, the cutting process can rarely be continued, because, due to the expansion of the preparation, the first cut can be disproportionately thick.

[0009]

A diamond knife, which is typically used in ultramicrotomy, should be loaded with a maximum of 0.35 μm thick sections. The preparation expansion can exceed this value and therefore lead to damage to the knife. In addition, through the power supply necessary for the lamps, there are additional space requirements and costs for the power supply and the control of the fluorescent lamps.

Problem of the invention

[0010]

Therefore, the invention is based on the problem of creating a microtome or an ultramicrotome having an illumination system that is easy to install, to maintain, and that does not transfer thermal effects to the microtome.

[0011]

The above problem is solved by a microtome comprising the features of Claim 1.

[0012]

A large advantage in the use of white LEDs is that the white light has a color temperature of approximately 5000 to 6000K. Due to the short wavelengths, the bright gap during the calibration process is clearly visible. The vertical illumination shows more details in the sections that appear less clearly for the use of fluorescent lamps. The LED illumination thus brings an essential advantage for the user due to the more targeted calibration process and more precise inspection of the section.

[0013]

The microtome or ultramicrotome is provided with a knife, an object arm that can move relative to the knife, and at least one light source for illuminating an area around the preparation. The area around the preparation is defined by the knife, the gap between the knife and the preparation, and the preparation itself. The one or more light sources used for illumination are embodied as light-emitting diodes. The light-emitting diodes can be formed as a sub-floor illumination system. Another possibility is that the light-emitting diode is formed as a vertical illumination system and still another possibility is that the light-emitting diode is used as internal illumination for the preparation. Other advantageous configurations of the invention can be taken from the subordinate claims.

Embodiment

[0014]

In the drawing, the subject matter of the invention is shown schematically and described below with reference to the figures, wherein elements with the same effect are provided with the same reference symbols. Shown are:

[0015]

Figure 1, a side view of a microtome with partial view into the inner workings,

[0016]

Figure 2, a configuration of a vertical illumination system according to the state of the art,

[0017]

Figure 3, a side view of a sub-floor illumination system with at least one light-emitting diode,

[0018]

Figure 4, a front view of the sub-floor illumination system from Figure 3,

[0019]

Figure 5, a side view of a vertical illumination system with several light-emitting diodes,

[0020]

Figure 6, a front view of the vertical illumination system from Figure 5, and

[0021]

Figure 7, a side view of an internal illumination system for the preparation.

[0022]

The microtome or ultramicrotome shown in Figure 1 has an object arm 3, which can move up and down and on which an object or preparation 5 is mounted. In the description below, the alternative designation "microtome or ultramicrotome" is not used. It is clear for someone skilled in the art that several types are to be understood under the term microtome 1. For the up and down movement, the preparation 5 is led past the blade of a knife 7, so that a thinner section is generated. For testing the cutting process and the quality of the knife 7, an observation microscope 9 is provided. The observation microscope 9 is mounted on a carrier arm 11 of the microtome 1. The observation microscope 9 defines an optical axis, which is designated with 13. For illuminating the knife 7/preparation 5 area, there is a sub-floor light source 15, whose light is guided with an optical fiber 17 to the knife 7/preparation 5 area in the embodiment described here. The optical fiber 17 is arranged such that a beam 12 directed upwards is produced, which illuminates the knife 7/preparation 5 area.

[0023]

A vertical illumination system of the state of the art is shown in Figure 2. Here, in comparison to Figure 1, several parts of the microtome are left out in order to obtain a better detailed view. The microtome comprises a vertical illumination system 20, which is used not only for illuminating the work area, but also the light should be reflected into a collection tank 21 filled with water for sections in the direction of the optical axis 13 of the observation microscope 9. The vertical illumination system 20 defines an illumination direction 25 pointing in the direction of the collection tank 21. In the collection tank 21, a water level 22 is formed, from which light is reflected as uniformly as possible in order to achieve clear identification of the sections with their interference colors. From the resulting interference colors, the user can estimate the thickness of the section. To prevent water bridges between the knife 7 and the preparation (not shown here) during the cutting, the process is often performed with a somewhat lowered water level 22. In the embodiment shown here, the water level 22 is curved. In order to let such surfaces reflect uniformly, fluorescent lamps 23 provided with a focusing screen 24 can be used for the vertical illumination system 20. The necessary size and position of the illuminated surface are determined by the geometry of the curved water level 22. The heat output of the illumination system should be as low as possible. Heating of the preparation leads to expansion and thus to an increase of the section thickness. Likewise, the heat input due to the fluorescent lamps 23 leads to an unstable section thickness.

[0024]

Figure 3 shows schematically a first embodiment of the present invention. Several parts of the microtome are likewise left out in order to focus on the essential parts of the invention. A sub-floor illumination system 30 is provided. The sub-floor illumination system 30 comprises at least one light-emitting diode 31, in front of which a focusing screen 32 can be placed. The sub-floor illumination system 30 is placed underneath the knife 7 and defines a light beam 33. If the light beam 33 emitted from the sub-floor illumination system 30 coincides with the optical axis of the observation microscope, the gap between the knife 7 and the preparation 5 is bright. Here, the light beam 33 is reflected from the rear side 34 of the knife and onto the preparation 5. The focusing screen 32 makes the illumination of the gap uniform.

[0025]

Figure 4 shows a front view of the arrangement shown in Figure 3. The observation microscope 9 is a stereo microscope and defines a first and a second optical axis 13a and 13b. The sub-floor illumination system 30 comprises at least the first and second light-emitting diodes 31a and 31b, which each emit a light beam or bundle 33a and 33b, which are reflected by the rear side 34 of the knife (see here the representation in Figure 3). Due to the low illuminating angle of the first and the second light-emitting diodes 31a and 31b, the best illumination is obtained when at least one of the light-emitting diodes 31a or 31b coincides with the first or the second optical axis 13a and 13b of the observation microscope 9. The first and the second light-emitting diodes 31a and 31b are therefore inclined relative to each other by an angle a, which corresponds to the observation angle of the observation microscope 9.

[0026]

Figure 5 shows an embodiment of the invention, in which several light-emitting diodes 41 form the vertical illumination system 20 from Figure 2. The light-emitting diodes 41 are arranged such that optimum reflection conditions are produced for a flat and curved water level 22. Figure 5 shows the side view of this embodiment and Figure 6 here represents the front view. In Figure 5, only 5 light-emitting diodes 41 are shown schematically. However, this embodiment involves a surface area on the order of magnitude of hundreds of light-emitting diodes. For a flat water level, this light-emitting diode area can be smaller. However, because the process is often performed with a lowered water level to prevent water bridges to the preparation 5 during cutting, the necessary light-emitting diode area grows as a function of the curvature of the water level 22. To optimize the brightness, the light-emitting diodes 41 are, in turn, inclined. A focusing screen 42 underneath the light-emitting diodes 41 is necessary to achieve uniform reflection on the water

level 22. The vertical illumination system 20 defines an illumination direction 25 pointing in the direction of the collection tank 21. The illumination light is reflected from the water level 22 in the direction of the optical axis 13 of the observation microscope 9. Figure 6 shows the front view of the representation from Figure 5. The light-emitting diodes 41 are also inclined in this view and aligned in the direction towards the water level 22. Therefore, the light emitted from the light-emitting diodes 41 points optimally in the illumination direction 25 for the water level 22.

[0027]

Likewise, an internal illumination system 50 for the preparation (see Figure 7) is conceivable with at least one light-emitting diode 51. In this case, the application primarily has the large advantage of low heat output in comparison to miniature light bulbs. The light-emitting diode is provided in the object arm 3 behind the preparation 5. The object arm 3 has a continuous tube 52, in which are guided the electrical cable 53 for the power supply to the light-emitting diodes 51. Relative to a rather stiff optical fiber from the state of the art, there is the advantage that the cable 53 for the electrical power supply can be very flexible. This is because the cutting can be disrupted by even the smallest forces (e.g., due to the optical fiber), which have the result that the preparation is moved together with the illumination system during cutting, but the optical fiber is connected to a stationary light source.

[0028]

A power supply for the light-emitting diodes 51 in the object arm 3 or for all of the light-emitting diodes of the microtome with a battery without an external cable is also conceivable.

[0029]

The invention was described with reference to a special embodiment. However, it is obvious that changes and modifications can be performed, without leaving the protective scope of the following claims.

List of reference symbols

1	Microtome
3	Object arm
5	Preparation
7	Knife
9	Observation microscope
11	Carrier arm
13	Optical axis

13a First optical axis
13b Second optical axis
15 Sub-floor light source
17 Optical fiber
20 Vertical illumination system
21 Collection tank
22 Water level
23 Fluorescent lamps
24 Focusing screen
25 Illumination direction
30 Sub-floor illumination system
31 Light-emitting diode
31a First light-emitting diode
31b Second light-emitting diode
32 Focusing screen
33 Light beam
33a Light beam
33b Light beam
34 Rear side of knife
41 Light-emitting diodes
42 Focusing screen
50 Internal illumination system for preparation
51 Light-emitting diode
52 Continuous tube
53 Cable
α [sic; a] Angle

Claims

1. Microtome or ultramicrotome with a knife (7), an object arm (3) that can move relative to the knife, and at least one light source for illuminating an area around the preparation (5), characterized in that the one or more light sources comprise at least one light-emitting diode (31, 41, 51).

2. Microtome or ultramicrotome according to Claim 1, characterized in that the one or more light-emitting diodes (31) are embodied as a sub-floor illumination system (30).

3. Microtome or ultramicrotome according to Claim 2, characterized in that the sub-floor illumination system (30) comprises at least one light-emitting diode (31) and a focusing screen (32) placed in front of the light-emitting diode.

4. Microtome or ultramicrotome according to Claim 2, characterized in that the one or more light-emitting diodes (31) are placed in the microtome, such that a light beam (33) emitted by the sub-floor illumination system (30) is reflected by a rear side (34) of the knife and on the preparation (5), in order to achieve uniform illumination of the gap between the knife (7) and the preparation (5).

5. Microtome or ultramicrotome according to Claim 4, characterized in that a first and a second light-emitting diode (31a and 31b) are provided, which are inclined relative to each other by an angle (α), and wherein at least one of the light-emitting diodes (31a or 31b) coincides with the first or the second optical axes (13a and 13b) of the observation microscope (9).

6. Microtome or ultramicrotome according to Claim 1, characterized in that several light-emitting diodes (41) are embodied as a vertical illumination system (20).

7. Microtome or ultramicrotome according to Claim 6, characterized in that the light-emitting diodes (41) are arranged at an angle for optimizing the brightness.

8. Microtome or ultramicrotome according to Claim 6, characterized in that a focusing screen 42 is provided underneath the light-emitting diodes (41).

9. Microtome or ultramicrotome according to Claim 6, characterized in that approximately a hundred light-emitting diodes are arranged over an area and define an illumination direction (25) pointing in the direction of a collection tank (21) onto the knife (7).

10. Microtome or ultramicrotome according to Claim 1, characterized in that at least one of the light-emitting diodes (51) defines an internal illumination system (50) for the preparation.

11. Microtome or ultramicrotome according to one of Claims 1 to 10, characterized in that the power supply to the light-emitting diodes (31, 41, 51) is realized via a battery.

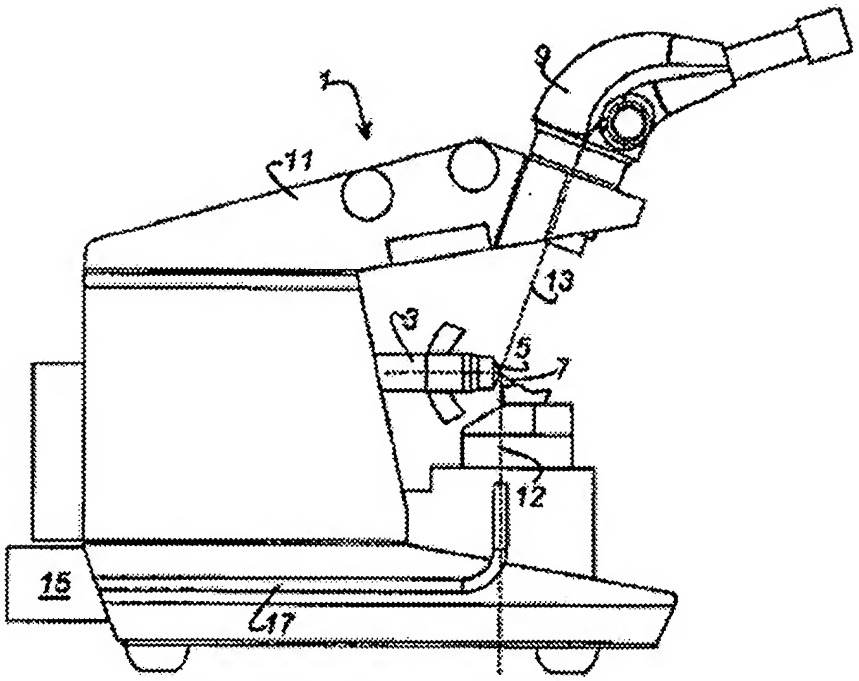

Fig. 1

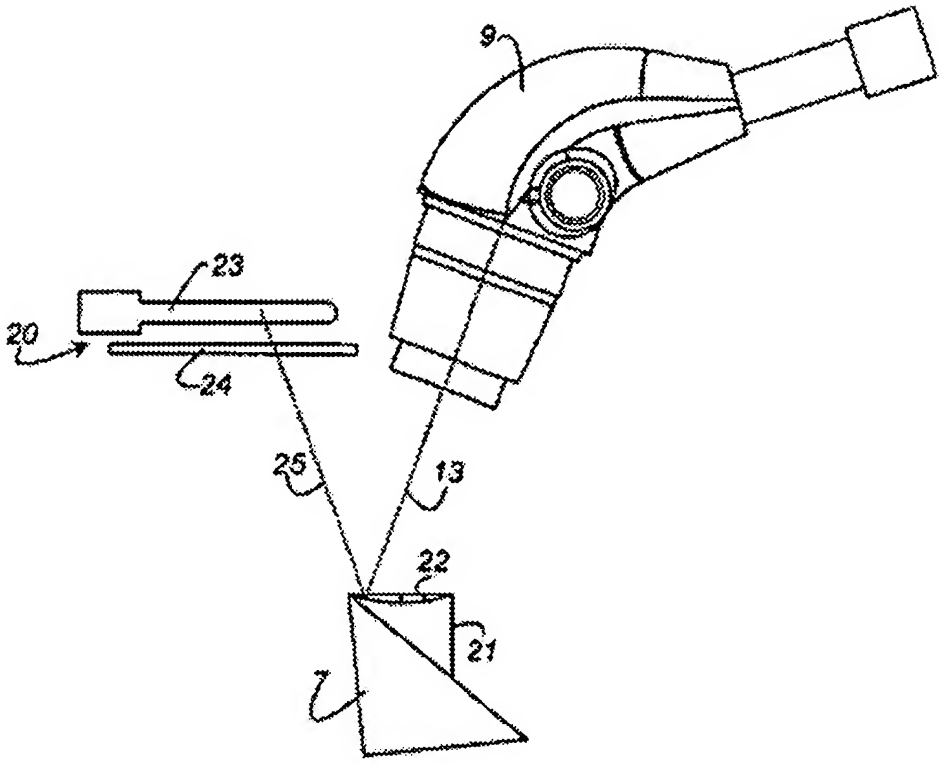

Fig. 2

Key: A State of the art

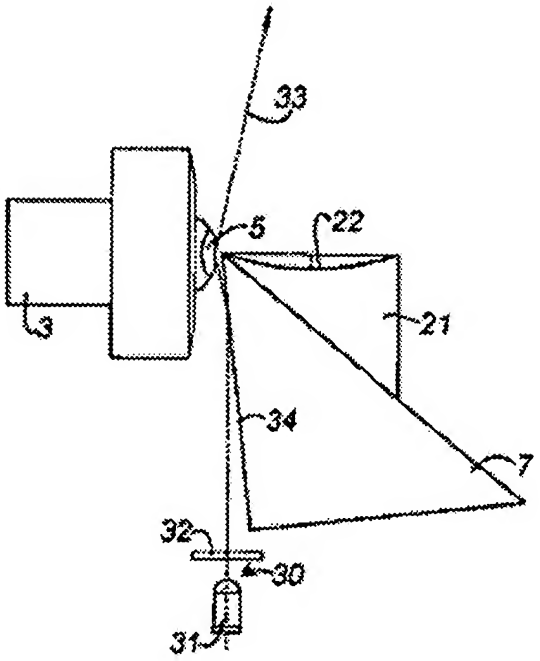

Fig. 3

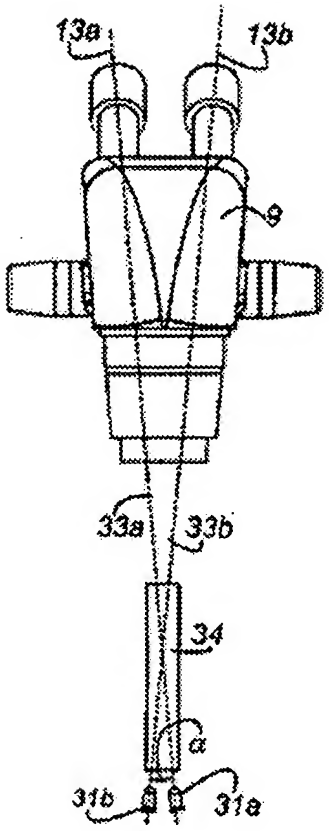

Fig. 4

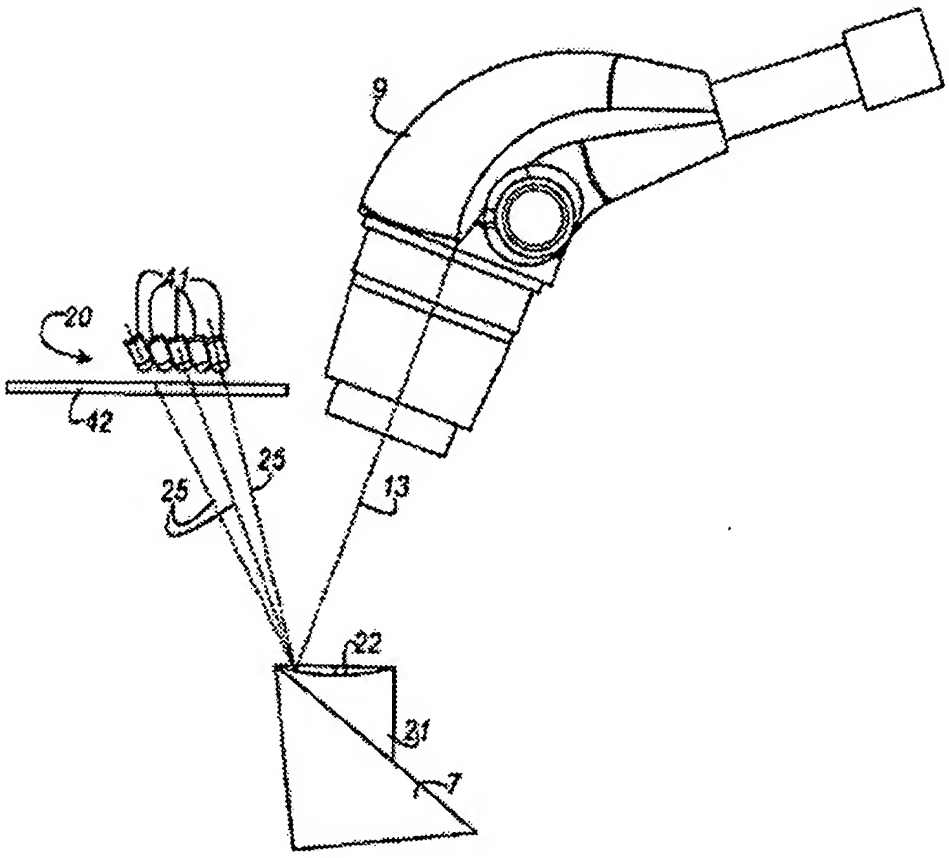

Fig. 5

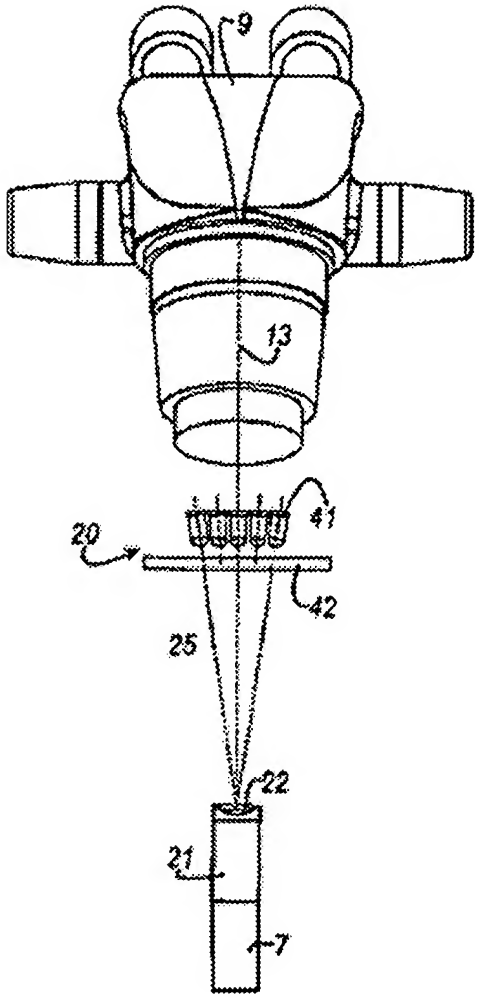

Fig. 6

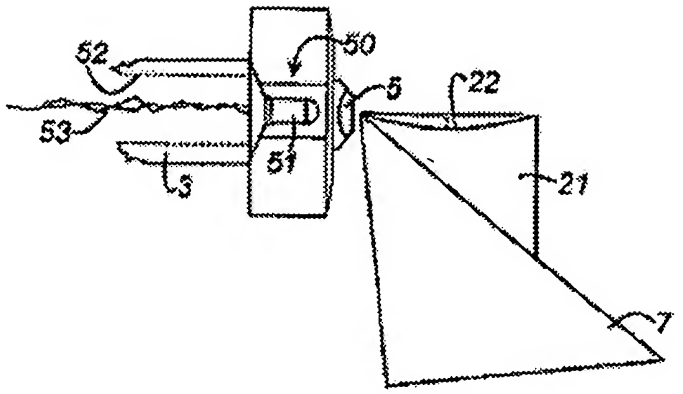

Fig.7